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NASA Aeronautical Technology Theme
Travel Baseline Definition
Door-to-Door Time Study
August 2003

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- Background/Purpose
- Form and Content of Baseline I
- Intercity Trip Making
- Components of Door-to Door Trip Time
- Implications

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Background/Purpose

- Define a Historical Travel Baseline for Use in Support of NASA's Mobility/Capacity Analyses
- Mobility is the Ability to Move Persons or Goods from a Point of Origin to a Final Destination
- Develop and Describe a Manageable Number of "Typical" or "Representative" Trips – Focus on Intercity Trips
- Define "Typical" Trips Using the 1995 American Travel Survey (One Way Trips > 100 Miles)
- Describe the Travel Time Components of These Trips

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Form And Content of Baseline I

- 2 EXCEL Worksheets
  - 6 Typical Auto Trips
  - 12 Typical Air Trips
- Auto Trips
  - 3 Distance Blocks
  - 2 Trip Point of Origin (Outside MSA/Within MSA)
- Air Trips
  - 3 Distance Blocks (2 Services in Each Block)
    - Short Distance (Jet/Turboprop)
    - Medium and Long Distance (Direct/Connect Flights)
  - 2 Trip Point of Origin (Outside MSA/Within MSA)

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Form And Content of Baseline I

- Parameters
  - Auto
    - Total Door-to-Door Trip Time
    - Access/Egress Time Penalty
    - Line Haul Time
    - Stop Time
  - Air (Scheduled/ “Actual”)
    - Total Door-to-Door Trip Time
    - Access/Egress Time
    - Terminal Time
    - Wait Time
    - Connect Time
    - Gate to Gate Time (Direct/Connect Flights)

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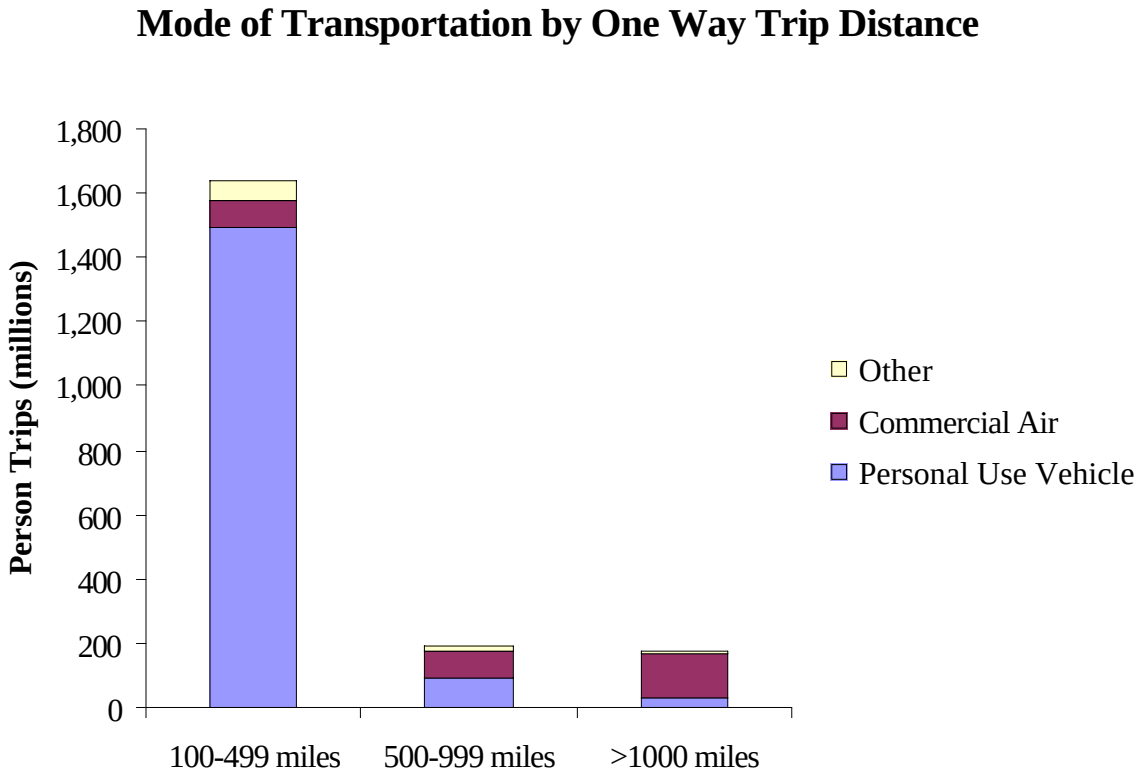
Intercity Trip Making – 1995 American Travel Survey



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Intercity Trip Making – Typical Trips

Distance Block	100-499 miles	500-999 miles	≥1,000 miles
Air Trips			
Percent Direct Flights	100%	65%	38%
Median Distance (miles)	328	740	1,650
Total Trip Time (minutes)	210	292	437
Auto Trips			
Median Distance (miles)	136	655	1,280
Total Trip Time (minutes)	141	679	1,910
Time at Air Distance (minutes)	336	756	2,247

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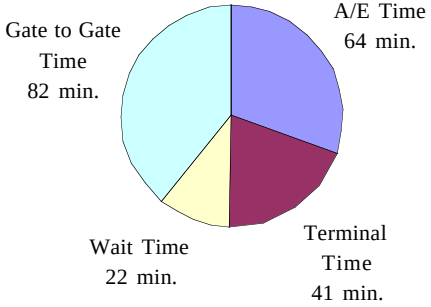
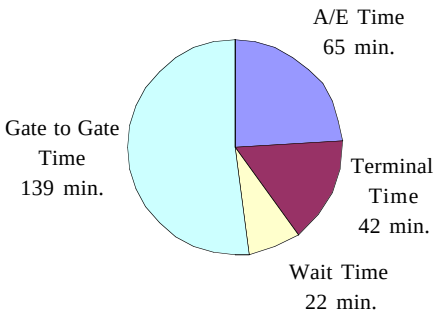
Components of Door-to-Door Trip Time
Direct Air Trips

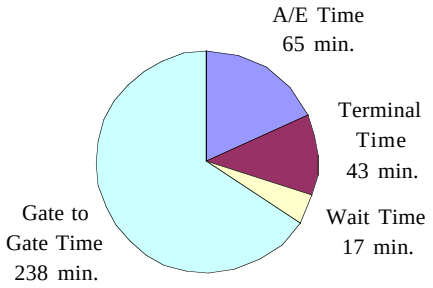
Direct Air Trips 100-499 Miles
Trip Time = 210 Minutes



Direct Air Trips 500-999 miles
Trip Time = 268 Minutes



Direct Air Trips ≥ 1,000 Miles
Trip Time = 364 minutes



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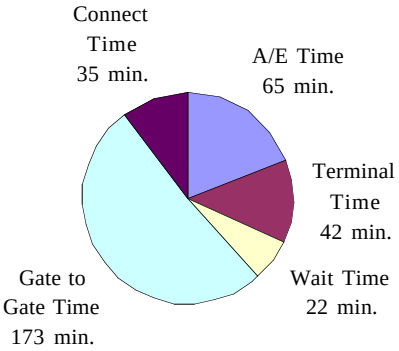
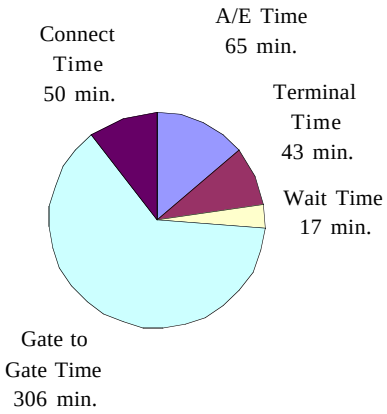
Components of Door-to-Door Trip Time
Connect Air Trips

Connect Air Trips 500-999 Miles
Trip Time = 337 Minutes



Connect Air Trips ≥ 1,000 Miles
Trip Time = 482 Minutes



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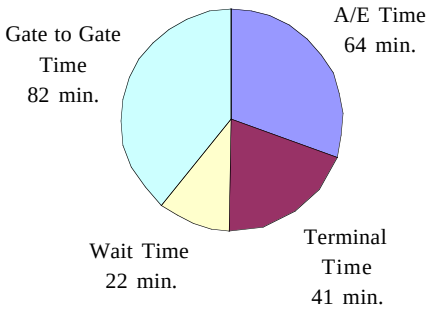
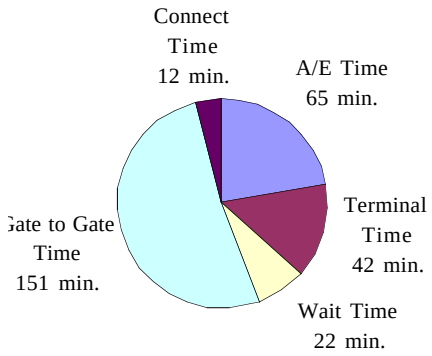
Components of Door-to-Door Trip Time
Weighted Average Direct/Connect Air Trips

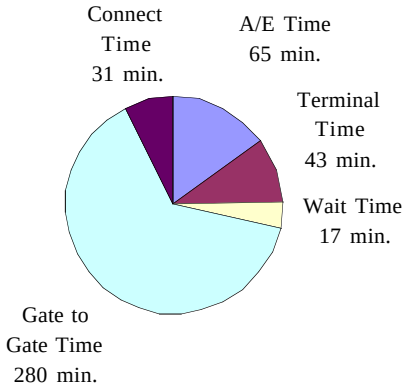
Direct Air Trips 100-499 Miles
Trip Time = 210 Minutes



Air Trips 500-999 Miles
Trip Time = 292 minutes



Air Trips ≥ 1,000 Miles
Trip Time = 437 minutes



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Components of Door-to-Door Trip Time (minutes)
Air Trips

Distance Block	100-499 miles			500-999 miles			≥1,000 miles		
Trip Type	Jet	Turboprop	Weighted Average	Direct	Connect	Weighted Average	Direct	Connect	Weighted Average
Percent Direct Flights			100%			65%			38%
Median Distance			328			740			1,642
A/E Time	64	64	64	65	65	65	65	65	65
Terminal Time	41	41	41	42	42	42	43	43	43
Wait Time	18	45	22	22	22	22	17	17	17
Gate-to-Gate Time	79	103	82	139	173	151	238	306	280
Connect Time	0	0	0	0	35	12	0	50	31
Total Trip Time	203	253	210	271	337	292	364	482	437

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Components of Door-to-Door Trip Time (minutes)
Auto Trips

Distance Block	100-499 Miles	500-999 Miles	≥1,000 Miles
A/E Time Penalty	3	4	5
Line Haul Time	137	616	1,192
Stop Time	0	60	113
Overnight Stop Time	0	0	600
Total Trip Time	141	679	1,910
Median Distance (miles)	136	655	1,280

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Implications

- Commercial Air Trips Represent a Relatively Small Portion of Total Intercity Trip Making
- A Significant Portion of the Time Incurred in a Typical Intercity Trip on the Commercial Air System Is Outside the Airplane

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Implications

- Strategies Focused on “Improving” the Conventional Commercial Air System Would Not Significantly Impact Overall Intercity Travel Times
- However, Such Strategies Could Produce Significant Improvements in Door to Door Travel Times for Air Travelers

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Implications

- Cutting Air Gate to Gate Time in Half Would Reduce Total US Intercity Travel Time by 6.7%
  - Air Travelers Would Have a 19.6% Reduction in Door to Door Trip Time for Trips of < 500 miles
  - Air Travelers Would Have a 25.8% Reduction in Door to Door Trip Time for Trips of 500 – 1,000 miles
  - Air Travelers Would Have a 32.1% Reduction in Door to Door Trip Time for Trips of > 1,000 miles

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Implications

- Converting Connect Flights to Direct Flights Would Reduce Total US Intercity Travel Time by 2.8%
  - Air Travelers Would Have a 8.1% Reduction in Door to Door Trip Time for Trips of 500 – 1,000 miles
  - Air Travelers Would Have a 16.8% Reduction in Door to Door Trip Time for Trips of > 1,000 miles

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Implications

- Potential Modal Diversion Could Result in Additional Improvement
  - Improved Air Door-to-Door Trip Times Will Get Some People Out of Their Cars
  - Can't Really Say How Many Without a Modal Diversion Analysis

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Implications

- Diverting 10% of Auto Travelers to Air for Trips > 500 Miles Would Reduce Total US Intercity Travel Time by 1.9%
- Diverting 90% of Auto Travelers to Air for Trips > 500 Miles Would Reduce Total US Intercity Travel Time by 16.8%

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Implications

- Diverting 10% of Auto Travelers to Air for Intercity Trips of All Distances Would Reduce Total US Intercity Travel Time by 3.8%
- Diverting 90% of Auto Travelers to Air for Intercity Trips of All Distances Would Reduce Total US Intercity Travel Time by 34.2%
- This Latter Diversion Would Require Radical Changes in the Relative Costs and Times of Air vs. Competing Modes

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Implications

- Target Areas
  - Potential for Significantly Improving Mobility May Lie In Reducing the Generalized Cost (Dollars, Time in All Its Components, and Other Hassles) of Air Travel for Trips of < 500 miles
  - Example: Reduce Access Time to Airport Through Increased Utilization of Smaller Airports

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Implications

- Target Areas
  - Another Potential Area for Significantly Improving Mobility May Lie in Changing the Fundamental Nature of Intercity Trips
    - Build It and They Will Come
    - Example: Pathfinder Strategic Performance Target – Same Day, Direct Round Trip Access to Any Place Within the US

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Backup Slides

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Contents

- Intercity Travel as Represented in the 1995 American Travel Survey
- Representative Trips
- Level of Service Parameters
- Travel Baseline
- Impact Analysis

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Intercity Travel as Represented in the 1995 American Travel Survey

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1995 American Travel Survey

- Approximately 80,000 randomly selected house-holds nationwide were interviewed for the American Travel Survey.

- The survey collected information about all trips of 100 miles or more, one way, taken by house-hold members in 1995.

- For this analysis non US destinations were filtered out by means of the variable “state or foreign country code of destination” (about 4% of person trips).

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Definition of Distance Blocks

- The three blocks chosen were one way trip distance < 500 miles, 500 to 999 miles, and ≥ 1,000 miles.

- These three blocks effectively divide intercity trip making into three domains - the first dominated by auto (< 500 miles), a second highly competitive area (500 to 999 miles), and a third dominated by air (≥ 1,000 miles).

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Intercity Trips < 500 miles

- The shortest block accounts for 1,492 million auto person trips (75% of total domestic person trips) and 89 million commercial air person trips (4% of total domestic person trips).
- This block accounts for 92% of all auto trips and 28% of all commercial air trips.
- Auto accounts for 91% of all trips within this distance block, and commercial air accounts for 5% with the remainder in all "other" modes.
- The median one way distance for auto trips within this block was 136 miles, and 329 miles for commercial air trips.

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Intercity Trips 500 – 999 miles

- The middle block accounts for 90 million auto person trips (4.5% of total domestic person trips) and 90 million commercial air person trips (4.5% of total domestic person trips).

- This block accounts for 6% of all auto trips and 29% of all commercial air trips.

- Within this distance block, auto accounts for 48% of trips and commercial air accounts for another 48% with the remainder in all "other" modes.

- The median one way distance for auto trips within this block was 648 miles, and 740 miles for commercial air trips.

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Intercity Trips > 1,000 miles

- The longest block accounts for 32 million auto person trips (2% of total domestic person trips) and 136 million commercial air person trips (7% of total domestic person trips).
- This block accounts for 2% of all auto trips and 43% of all commercial air trips.
- Auto accounts for 18% of all trips within this distance block, and commercial air accounts for 79% with the remainder in all "other" modes.
- The median one way distance for auto trips within this block was 1,281 miles, and 1,642 miles for commercial air trips.

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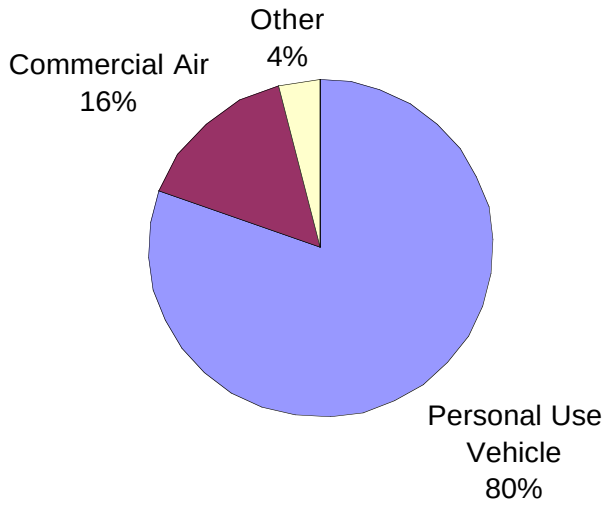
Intercity Trips by Mode



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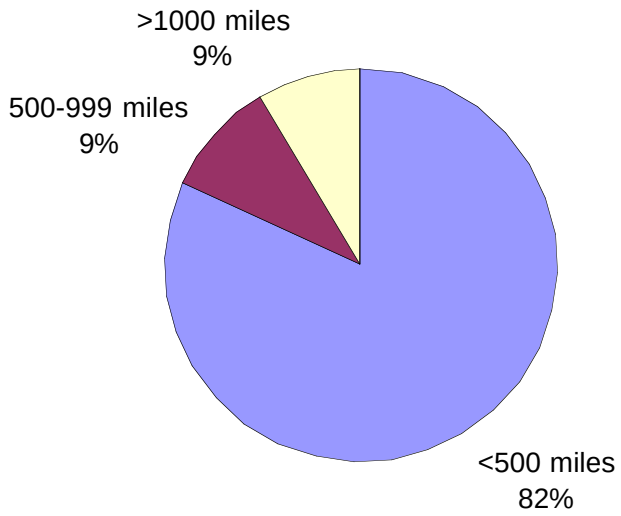
Intercity Trips by Distance Block



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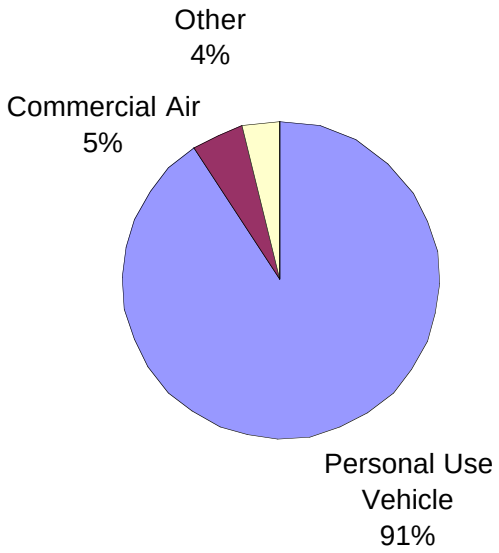
Intercity Trips of < 500 Miles by Mode



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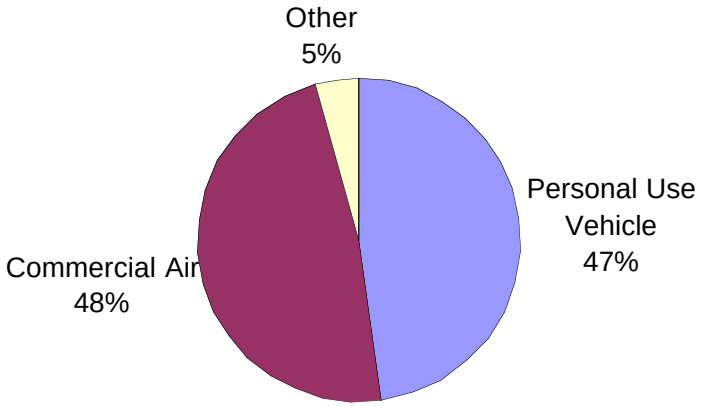
Intercity Trips of 500 to 999 Miles by Mode



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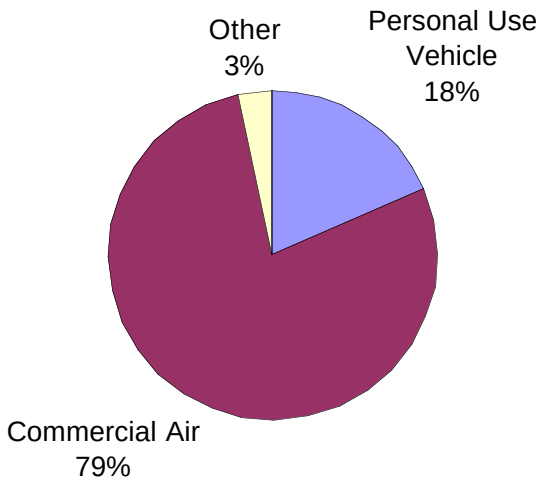
Intercity Trips of > 1,000 Miles by Mode



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Distribution of Trips by Distance Block

	Person Trips			
	Personal Use Vehicle		Commercial Air	
One Way Trip Distance	Total	Percent	Total	Percent
<500	1,492,116,000	92.5%	86,575,000	27.8%
500-999	89,868,000	5.6%	89,417,000	28.7%
≥1000	31,603,000	2.0%	135,879,000	43.6%
Total	1,613,587,000	100.0%	311,871,000	100.0%

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Trips by Distance Block and Mode as Percent of Total Person Trips

	Person Trips							
	Personal Use Vehicle		Commercial Air		Other		Total	
One Way Trip Distance	Total	Percent	Total	Percent	Total	Percent	Total	Percent
<500	1,492,116,000	74.5%	86,575,000	4.3%	62,999,000	3.1%	1,641,690,000	82.0%
500-999	89,868,000	4.5%	89,417,000	4.5%	8,465,000	0.4%	187,751,706	9.4%
≥1000	31,603,000	1.6%	135,879,000	6.8%	5,715,000	0.3%	173,197,000	8.6%
Total	1,613,587,000	80.6%	311,871,000	15.6%	77,179,000	3.9%	2,002,638,000	100.0%

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Mode Share by Distance Block

	Person Trips							
	Personal Use Vehicle		Commercial Air		Other		Total	
Round Trip Distance	Total	Percent	Total	Percent	Total	Percent	Total	Percent
<500	1,492,116,000	90.9%	86,575,000	5.3%	62,999,000	3.8%	1,641,690,000	100.0%
500-999	89,868,000	47.9%	89,417,000	47.6%	8,465,000	4.5%	187,751,000	100.0%
≥1000	31,603,000	18.2%	135,879,000	78.5%	5,715,000	3.3%	173,197,000	100.0%
Total	1,613,587,000	80.6%	311,871,000	15.6%	77,179,000	3.9%	2,002,638,000	100.0%

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Estimated Total Intercity Travel Time by Distance Block and Mode as Percent of Total Estimated Intercity Travel Time

	Personal Use Vehicle		Commercial Air		Total	
One Way Trip Distance	Travel Time (minutes x 10^6)	Percent Total	Travel Time (minutes x 10^6)	Percent Total	Travel Time (minutes x 10^6)	Percent Total
< 500	210,388	48.3%	18,181	4.2%	228,569	52.5%
500 – 999	61,021	14.0%	26,110	6.0%	87,131	20.0%
$\geq$ 1,000	60,362	13.9%	59,379	13.6%	119,741	27.5%
Total	331,771	76.2%	103,670	23.8%	435,441	100.0%

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MSA/Non MSA Distinction

- Significant variation with trips originating in or outside of a MSA (Metropolitan Statistical Area) - trips originating outside MSA fly less.
- Most trips originate within an MSA (64%), but 83% of commercial air trips originate within an MSA.
- Looked at another way, 20% of trips originating within a MSA use commercial air, while 7% of trips originating outside a MSA use commercial air.
- Implications are for mode diversion analysis, not for definition of typical trips.

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Representative Trips

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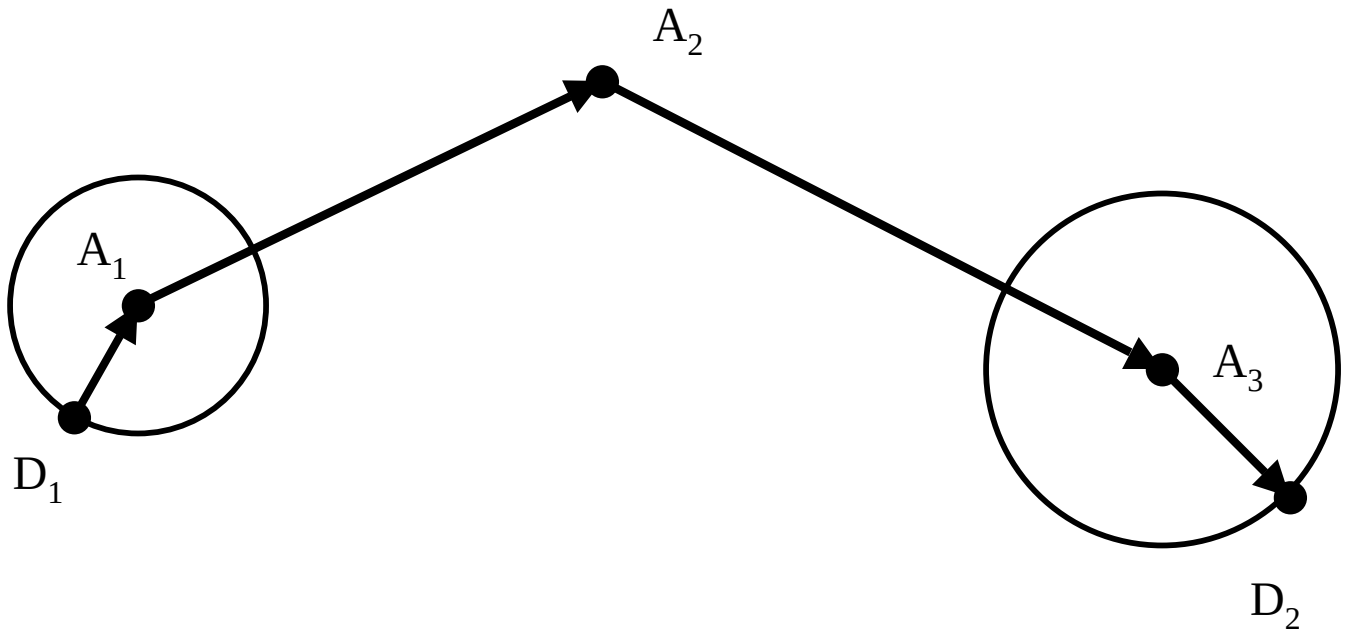
Simplified Commercial Air Trip Profile



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Simplified Commercial Air Trip Profile Description

Segment	Description
1	Depart doorstep D_1 **via ground transportation**, arrive air vehicle departure point A_1
2	Mode transition delay
3	Depart air vehicle departure point A_1 arrive air vehicle arrival point A_2
4	Mode transition delay (connecting flight layover)
5	Depart air vehicle departure point A_2 arrive air vehicle arrival point A_3
6	Mode transition delay
7	Depart air vehicle arrival point A_3 **via ground transportation,** arrive final destination D_2

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Baseline Door-to-Door Commercial Air Trip Time Components

Baseline Definition Trip Component	Corresponding Segment Number
Access/ Egress Time	1 plus 7
Terminal Time plus Wait Time	2 plus 6
Gate to Gate Time	3 plus 5
Connect Time	4

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Level of Service Parameters

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A/E (Access/Egress)Time

- Access time represents the time spent in reaching the airport, computed as Average Driving Distance to the Airport/Average Speed

  – Average driving distance to the airport (for large, medium, small MSAs and non MSAs) is from the 1995 ATS data.

  – Average speed is the average peak period speed for freeways and principal arterials (for large, medium, small MSAs) as reported by the Texas Transportation Institute, and an average “commute speed” (for non MSAs) as reported by the 1995 National Personal Transportation Survey.

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A/E (Access/Egress)Time

- Total A/E time is the sum of the A/E time for the origin region and the A/E time for the destination region.

- A/E times vary based on a city's size. Egress time (time spent in going from the airport to the ultimate destination) is assumed to equal access time for a given region.

- A/E times in the baseline are a trip weighted average based on the number of air trips by origin/destination size combination.

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A/E (Access/Egress)Time

	Large MSA	Medium MSA	Small MSA	Non MSA	Total
Average Driving Distance to Airport (miles)	15	17	20	36	21
Average Speed (mph)	34	38	41	39	38
Average Access Time (minutes)	26	27	30	55	34

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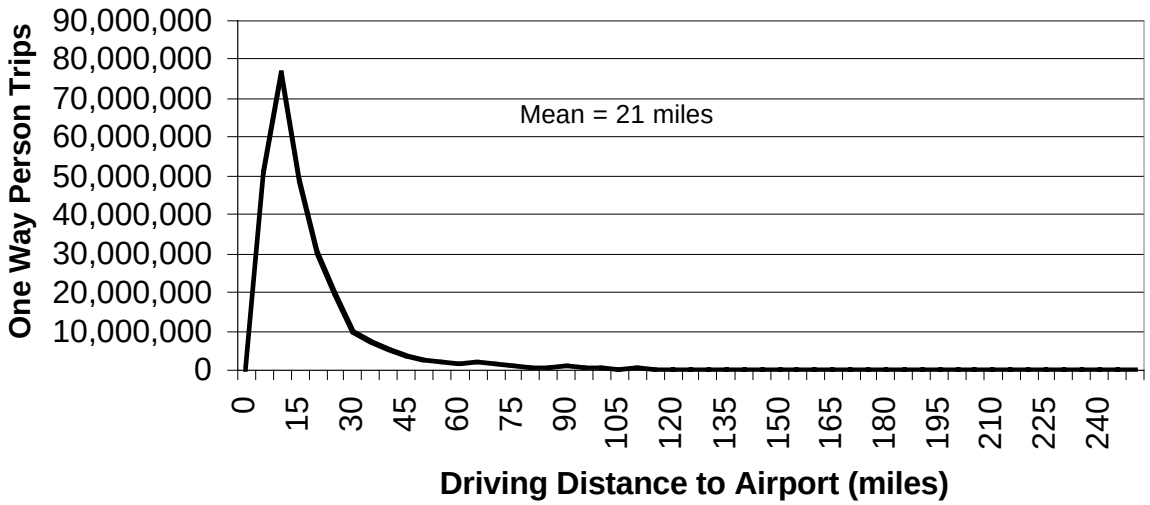
ATS Driving Distance to Airport - All Origins



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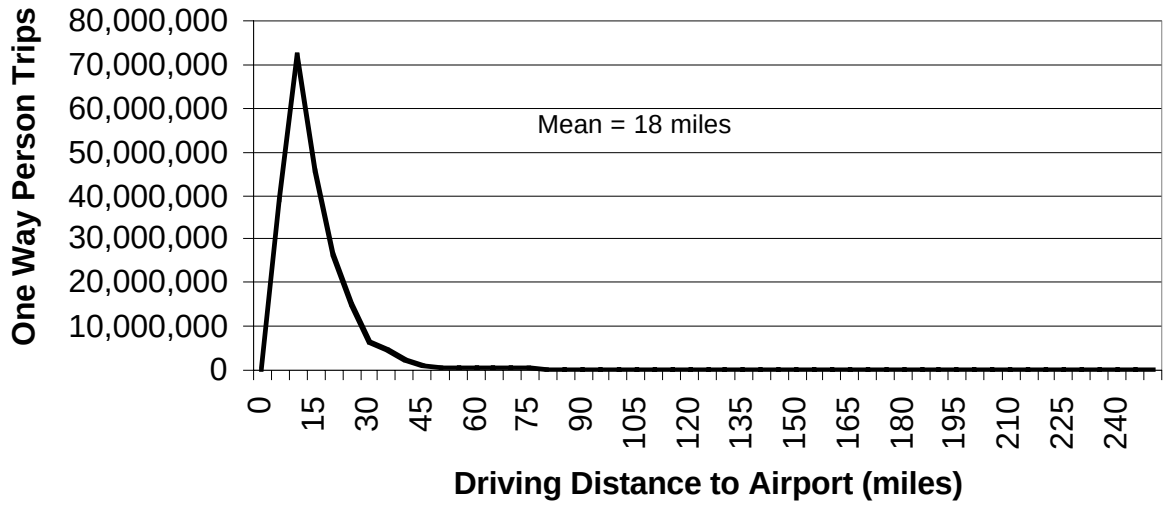
ATS Driving Distance to Airport - Origin MSA



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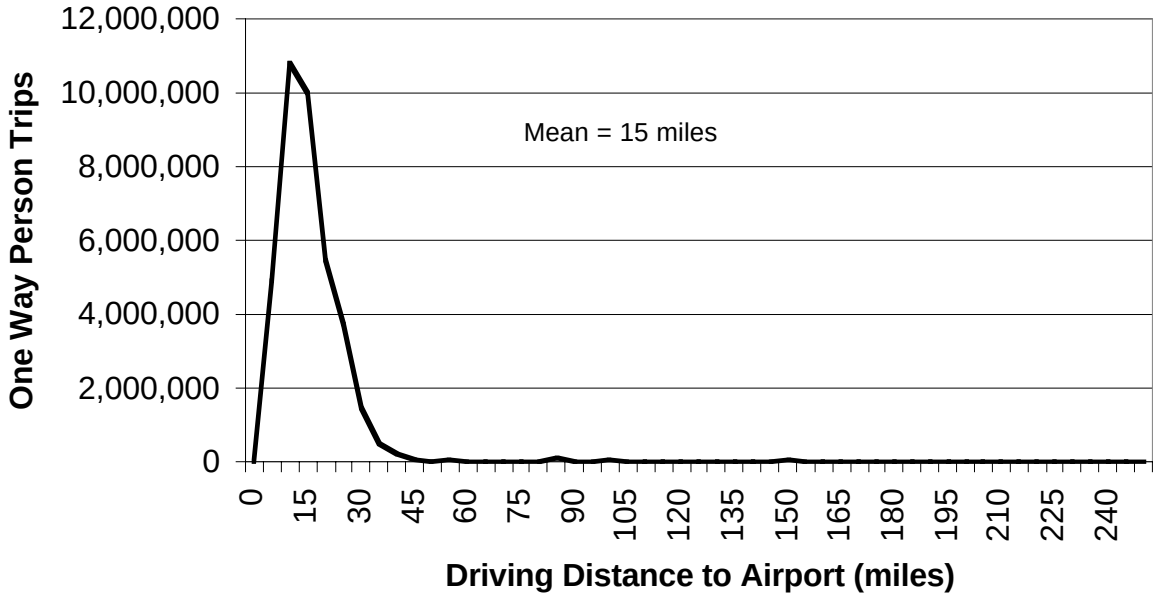
ATS Driving Distance to Airport - Origin Large MSAs



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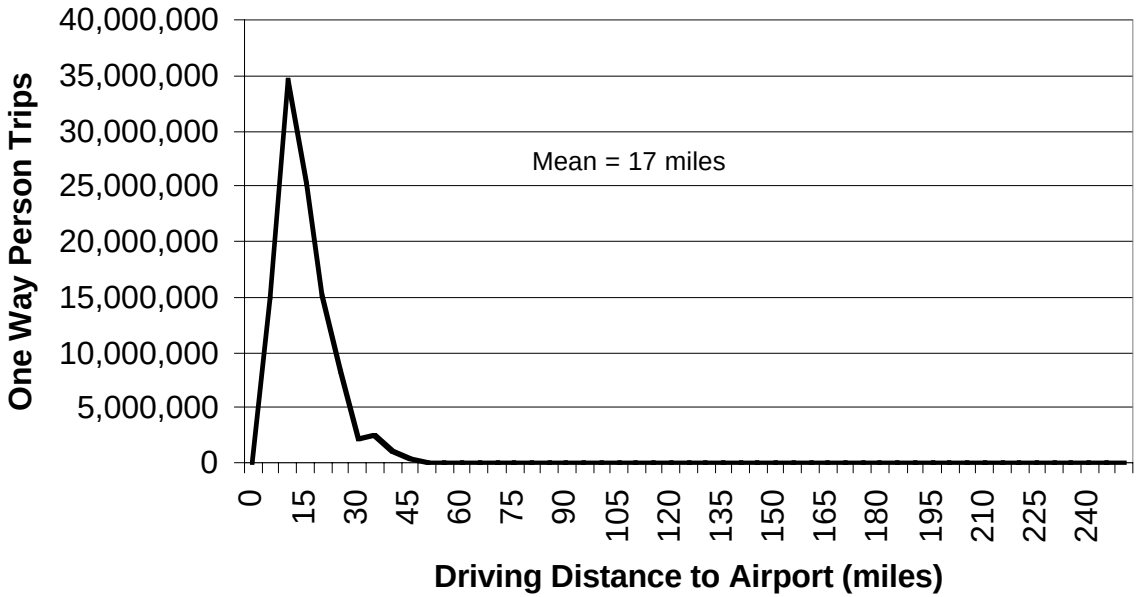
ATS Driving Distance to Airport - Origin Medium MSAs



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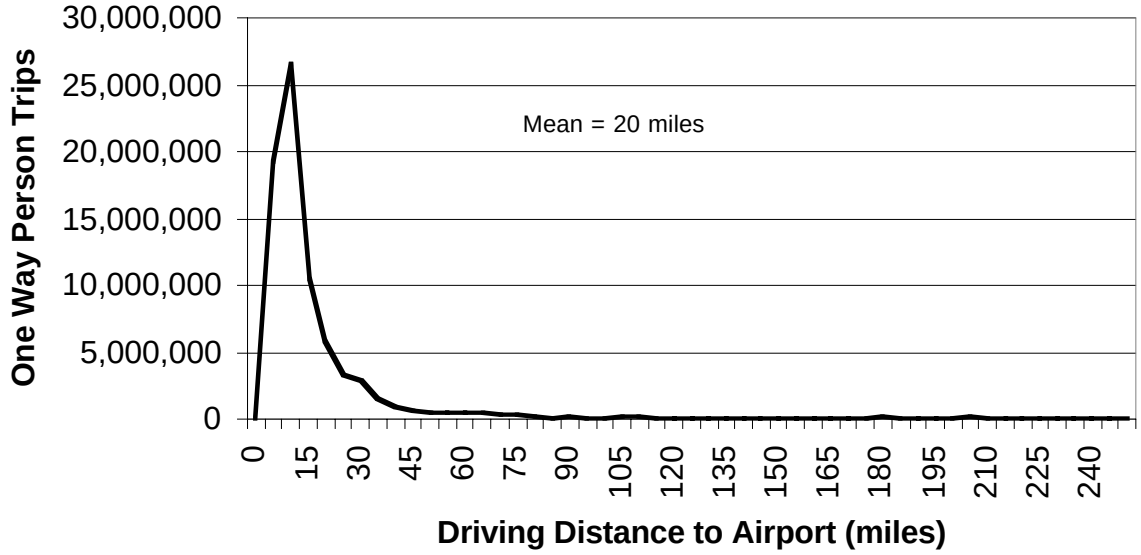
ATS Driving Distance to Airport - Origin Small MSAs



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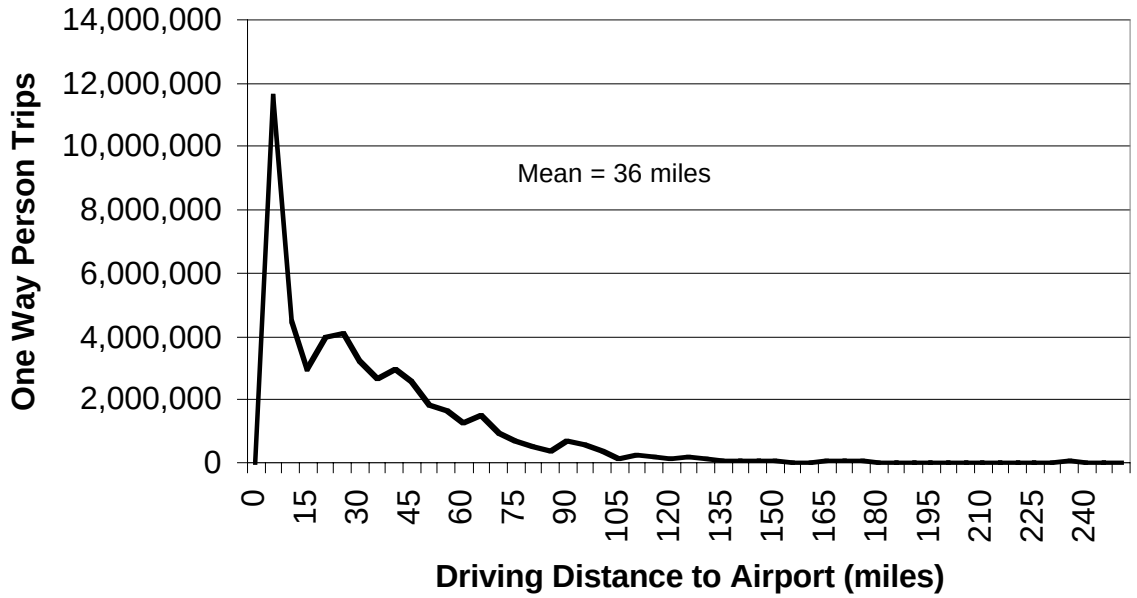
ATS Driving Distance to Airport - Origin Outside MSA



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Metropolitan Statistical Areas by Size Groups

- Based on 1997 population
- Large (> 7.5 million)
  - New York, Los Angeles, Chicago
- Medium (2.2 – 7.5 million)
  - Washington/Baltimore, San Francisco/Oakland/San Jose, Philadelphia, Boston, Detroit, Dallas/Fort Worth, Houston, Atlanta, Miami/Fort Lauderdale, Seattle/Tacoma, Phoenix, Cleveland, Minneapolis/St. Paul, San Diego, St. Louis, Denver, Pittsburgh, Tampa/St. Petersburg
- Small (< 2.2 million)
  - all others

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Terminal Time

- Time spent at the origin airport in departing ground transportation, purchasing a ticket, checking luggage, going through security, moving through the terminal to the departure gate, aircraft boarding, and time spent on board the aircraft before it leaves the gate plus the time at the destination airport between deplaning and departure from the airport facilities on ground transportation.

- Based on generalized terminal time tables developed for Volpe's CFS (Commercial Feasibility Study) model.

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Terminal Time

- These were based on information originally developed for the National Maglev Initiative, which was obtained from various local transportation studies.
- Terminal times indicated are the sum of the terminal time at the origin city and the terminal time at the destination city.
- Terminal times vary based on a city's size and the purpose of a trip.
- Terminal times in the baseline are a trip weighted average based on the number of air trips by purpose by origin/destination size combination.

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Terminal Time

Non Business Air Terminal Time (minutes)				Business Air Terminal Time (minutes)			
Origin Terminal	Destination Terminal			Origin Terminal	Destination Terminal		
	Small	Medium	Large		Small	Medium	Large
Small	41	44.5	48	Small	35	37.5	40
Medium	44.5	48	51.5	Medium	37.5	40	42.5
Large	48	51.5	55	Large	40	42.5	45

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Wait Time (Schedule Delay)

- The difference in time between when a person would like to make a trip and the time they are constrained to make a trip because of the inflexibility of the airline's schedule.
- Wait time (schedule delay) is calculated as 1/4 the headway.
- Wait time = 0.25*18/frequency
- Where 18 is number of hours of operation per day.

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Frequency

- The available seat weighted average of the number of flights scheduled (as indicated in the 1997 OAG data) in the city pair markets falling within the distance band defining typical trips for the given distance block (median distance $\pm$ 25 miles).

- Includes direct flights and published connect flights.

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Percent Jet

- The percentage of seats operated on jet aircraft in the city pair markets falling within the distance band defining typical trips for the given distance block (as indicated in the 1997 OAG data).

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Scheduled Gate to Gate Time

- For direct flights, the weighted (available seat) average "elapsed time" for the city pair markets falling within the distance band defining typical trips for the given distance block (as indicated in the 1997 OAG data).

- The average elapsed time for published connect flights serving these same markets.
  - Elapsed time was determined as the sum of the individual flight segment elapsed times.
  - A weighted average time was determined using the same weights as used for direct flights.

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Scheduled Connect Time

- The average connect time for published connect flights serving these same markets.
  - Connect time was determined as the average published connect time (departure minus arrival time of the connecting flights)within each market.
  - A weighted average time for all markets was determined using the same weights as used for elapsed time.

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"Actual" Gate To Gate Time

- The scheduled gate to gate time plus delay.

- For direct flights, the average minutes of delay for each of the city pair markets falling within the distance band defining typical trips for the given distance block (as indicated in the 1997 OAG data) was determined.
  - Obtained from BTS's 1997 airline on-time statistics (ASQP, Airline Service Quality Performance data).
  - Measure used – "Arrival Delay – The difference between the scheduled arrival time and the actual arrival time at the destination airport gate."

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"Actual" Gate To Gate Time

- A weighted (available seat) average delay for the city pair markets falling within the distance band defining typical trips for the given distance block (as indicated in the 1997 OAG data) was determined.

- This delay was added to the scheduled gate to gate time.

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"Actual" Gate To Gate Time

- For connect flights, city pair segments for connections within each market were taken from the published OAG schedules.
- The sum of the average minutes of delay for each of the city pair segments was determined for each connection.
- A flight weighted average delay was determined for each market.

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"Actual" Gate To Gate Time

- A weighted (available seat) average delay for the city pair markets falling within the distance band defining typical trips for the given distance block (as indicated in the 1997 OAG data) was determined.
- This delay was added to the scheduled gate to gate time for connect flights.

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"Actual" Connect Time

- Connect time was adjusted to account for the fact that delayed arrival on the first flight segment results in a shortened connect time.

- This adjustment was equal to the average delay on the first flight segment (by direction) of all the markets examined in estimating delay for connect flights.

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"Actual" Total Trip Time
Air Trips > 500 miles

- Direct flights – the sum of access/egress time, terminal time, wait time, and “actual” gate to gate time.

- Connect flights - the sum of access/egress time, terminal time, wait time, “actual” connect time, and “actual” gate to gate time.

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"Actual" Total Trip Time
Air Trips > 500 miles

- Weighted average – weights applied to individual time components. Weights based on U.S. DOT's 10% ticket sample and give the relative split between direct and connect flights in the city pair markets falling within the distance band defining typical trips for the given distance block (as indicated in the 1997 OAG data).

- About 35% of flights of between 500 and 1,000 miles involved a connection, while about 62% of flights over 1,000 miles involved a connection.

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"Actual" Total Trip Time
Air Trips < 500 miles

- Jet flights - the sum of access/egress time, terminal time, “jet” wait time, and “actual” “jet” gate to gate time.

- Turboprop flights - the sum of access/egress time, terminal time, “turboprop” wait time, and “actual” “turboprop” gate to gate time.

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"Actual" Total Trip Time
Air Trips < 500 miles

- Weighted average – weights applied to individual time components. Weights based on the percentage of seats operated on jet aircraft in the city pair markets falling within the distance band defining typical trips for the given distance block (as indicated in the 1997 OAG data).

- About 87% of available seats provided on flights of < 500 miles were on jet aircraft.

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“Scheduled" Total Trip Time
Air Trips

- Same as “actual” total trip time , except “scheduled” connect time used instead of “actual” connect time, and “scheduled” gate to gate time used instead of “actual” gate to gate time.

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Auto Access/Egress Time Penalty

- Attempts to account for highway congestion in metropolitan areas at each end of the intercity trip.
- Based on the approach developed for Volpe's CFS (Commercial Feasibility Study) model.
- Adds 10 minutes for each large origin city and each large destination city, 5 minutes for each medium origin city and each medium destination city, 0 minutes for small cities.

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Auto Line Haul Time

- This is the driving time required to cover the mileage between origin and destination calculated as Distance/Speed.
- Auto Speed
  - Based on a formula developed for Volpe's CFS (Commercial Feasibility Study) model, and revised to reflect conditions prevailing in 1997 based on FHWA rural interstate speed data.
  - (50 miles * 50 mph + (distance – 50) * 65 mph)/ distance
  - First 50 miles at 50 mph, all additional miles at 65 mph.
  - Validated against driving times from Rand McNally.com.

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Auto Stop Time

- Represents the time spent for refueling, rest stops, meals, and overnight stops if needed.
- Estimates a stopping penalty for each market as a function of distance.
- Based on a function developed for Volpe's CFS (Commercial Feasibility Study) model.
- For each travel day, add 0 minutes if distance < 200 miles, add 10 minutes if distance is 200-300 miles, add 50 minutes if distance is 300-500 miles, add 60 minutes if distance > 500 miles.

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Auto Stop Time

- Modified to account for a stop time for long distance trips involving overnight rest stops.
- Based on an analysis of ATS data to determine break point for overnight stops on long auto trips.
- Add 600 minutes (10 hours) if distance > 800 miles.

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Total Trip Time – Auto Trips

- Sum of access/egress penalty, line haul time, and stop time.

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Travel Baseline

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Typical Trips with Origin in MSA
1997 Baseline Commercial Air Trips

Distance Block	100-499 Miles	500-999 Miles	≥1,000 Miles
Number of Person Trips	71,762,000	74,346,000	111,687,000
Percent of Total Person Trips	3.6%	3.7%	5.6%
Median One Way Distance (miles)	339	742	1,667

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Typical Trips with Origin in MSA
1997 Baseline Air Trips (Jet)

Distance Block	100-499 Miles	500-999 Miles	≥1,000 Miles
A/E Time	59	60	60
Terminal Time	42	43	44
Wait Time (Direct)	17	23	16
Frequency (Direct)	15.7	8.4	6.9
Wait Time (Connect)	NA	23	16
Frequency (Connect)	NA	3.2	9.8
Scheduled Gate to Gate Time (Direct)	71	128	233
Scheduled Total Trip Time (Direct)	190	255	353
"Actual" Gate to Gate Time (Direct)	80	139	239
"Actual" Total Trip Time (Direct)	199	264	362
Scheduled Gate to Gate Time (Connect)	NA	153	292
Connect Time	NA	44	59
Scheduled Total Trip Time (Connect)	NA	323	471
"Actual" Gate to Gate Time (Connect)	NA	175	310
"Actual" Connect Time	NA	34	51
"Actual" Total Trip Time (Connect)	NA	335	481
Scheduled Total Trip Time (Weighted Average)	NA	278	430
"Actual" Total Trip Time (Weighted Average)	NA	289	439

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Typical Trips with Origin in MSA
1997 Baseline Air Trips (Turboprop)

Distance Block	100-499 Miles	500-999 Miles	≥1,000 Miles
A/E Time	59	NA	NA
Terminal Time	42	NA	NA
Total A/E Time + Terminal Time	101	NA	NA
Wait Time	45	NA	NA
Frequency	6	NA	NA
Scheduled Gate to Gate Time	96	NA	NA
Scheduled Total Trip Time	242	NA	NA
"Actual" Gate to Gate Time	105	NA	NA
"Actual" Total Trip Time	251	NA	NA
Percent Jet	89.25%	100.00%	100.00%

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Typical Trips with Origin outside MSA - 1997 Baseline Commercial Air Trips

Distance Block	100-499 Miles	500-999 Miles	≥1,000 Miles
Number of Person Trips	14,813,000	15,071,000	24,192,000
Percent of Total Person Trips	0.7%	0.8%	1.2%
Median One Way Distance (miles)	273	730	1,570

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Typical Trips with Origin outside MSA - 1997 Baseline Air Trips (Jet)

Distance Block	100-499 Miles	500-999 Miles	≥1,000 Miles
A/E Time	88	89	89
Terminal Time	39	40	41
Wait Time (Direct)	24	13	20
Frequency (Direct)	11.5	18.3	7.5
Wait Time (Connect)	NA	13	20
Frequency (Connect)	NA	2.4	5.9
Scheduled Gate to Gate Time (Direct)	64	128	225
Scheduled Total Trip Time (Direct)	215	270	375
"Actual" Gate to Gate Time (Direct)	74	140	234
"Actual" Total Trip Time (Direct)	225	282	384
Scheduled Gate to Gate Time (Connect)	NA	142	267
Connect Time	NA	48	58
Scheduled Total Trip Time (Connect)	NA	332	475
"Actual" Gate to Gate Time (Connect)	NA	165	288
"Actual" Connect Time	NA	37	47
"Actual" Total Trip Time (Connect)	NA	344	485
Scheduled Total Trip Time (Weighted Average)	NA	293	424
"Actual" Total Trip Time (Weighted Average)	NA	305	434

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Typical Trips with Origin outside MSA - 1997 Baseline Air Trips (Turboprop)

Distance Block	100-499 Miles	500-999 Miles	≥1,000 Miles
A/E Time	88	NA	NA
Terminal Time	39	NA	NA
Total A/E Time + Terminal Time	127	NA	NA
Wait Time	43	NA	NA
Frequency	6.2	NA	NA
Scheduled Gate to Gate Time	83	NA	NA
Scheduled Total Trip Time	253	NA	NA
"Actual" Gate to Gate Time	93	NA	NA
"Actual" Total Trip Time	263	NA	NA
Percent Jet	75.39%	100.00%	100.00%

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Typical Trips with Origin in MSA
1997 Baseline Auto Trips

Distance Block	100-499 Miles	500-999 Miles	≥1,000 Miles
Number of Person Trips	883,860,000	58,802,000	21,845,000
Percent of Total Person Trips	44.1%	2.9%	1.1%
Median One Way Distance (miles)	141	659	1,265
A/E Time Penalty	5	5	6
Line Haul Time	142	619	1,179
Total Line Haul Time	147	624	1,185
Speed (mph)	60	64	64
Stop Time	0	60	110
Overnight Stop Time	0	0	600
Total Trip Time	147	684	1,895

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Typical Trips with Origin outside MSA - 1997 Baseline Auto Trips

Distance Block	100-499 Miles	500-999 Miles	≥1,000 Miles
Number of Person Trips	608,257,000	31,066,000	9,758,000
Percent of Total Person Trips	30.4%	1.6%	0.5%
Median One Way Distance (miles)	129	649	1,311
A/E Time Penalty	1	1	2
Line Haul Time	131	610	1,221
Total Line Haul Time	132	611	1,223
Speed (mph)	59	64	64
Stop Time	0	60	120
Overnight Stop Time	0	0	600
Total Trip Time	132	671	1,943

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Impact Analysis

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Impact of a 50% Reduction in Gate-to-Gate Times

Trips of < 500 miles	
Percent Improvement in Door-to-Door Time	19.6%
Percent of Total Person Trips	4.2%
Total Impact	0.8%
Trips of 500 – 999 miles	
Percent Improvement in Door-to-Door Time	25.8%
Percent of Total Person Trips	6.0%
Total Impact	1.5%
Trips of ≥ 1,000 miles	
Percent Improvement in Door-to-Door Time	32.1%
Percent of Total Person Trips	13.6%
Total Impact	4.4%
Total All Distances	6.7%

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Impact of a Conversion of Connect Flights to Direct Flights

Trips of 500 – 999 miles	
Percent Improvement in Door-to-Door Time	8.1%
Percent of Total Intercity Travel Time	6.0%
Total Impact	0.5%
Trips of ≥ 1,000 miles	
Percent Improvement in Door-to-Door Time	16.8%
Percent of Total Intercity Travel Time	13.6%
Total Impact	2.3%
Total All Distances	2.8%

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Impact of a 10% Diversion of Auto Travelers to Air for Trips > 500 Miles

Trips of 500 – 999 miles	
Percent Improvement in Door-to-Door Time	5.7%
Percent of Total Intercity Travel Time	14.0%
Total Impact	0.8%
Trips of ≥ 1,000 miles	
Percent Improvement in Door-to-Door Time	7.7%
Percent of Total Intercity Travel Time	13.9%
Total Impact	1.1%
Total All Distances	1.9%

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Impact of a 90% Diversion of Auto Travelers to Air for Trips > 500 Miles

Trips of 500 – 999 miles	
Percent Improvement in Door-to-Door Time	51.3%
Percent of Total Intercity Travel Time	14.0%
Total Impact	7.2%
Trips of ≥ 1,000 miles	
Percent Improvement in Door-to-Door Time	69.4%
Percent of Total Intercity Travel Time	13.9%
Total Impact	9.6%
Total All Distances	16.8%

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Impact of a 10% Diversion of Auto Travelers to Air for Trips With Equal Average Trip Lengths

Trips of < 500 miles	
Percent Improvement in Door-to-Door Time	3.8%
Percent of Total Intercity Travel Time	48.3%
Total Impact	1.8%
Trips of 500 – 999 miles	
Percent Improvement in Door-to-Door Time	6.1%
Percent of Total Intercity Travel Time	14.0%
Total Impact	0.9%
Trips of ≥ 1,000 miles	
Percent Improvement in Door-to-Door Time	8.1%
Percent of Total Intercity Travel Time	13.9%
Total Impact	1.1%
Total All Distances	3.8%

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Impact of a 90% Diversion of Auto Travelers to Air for Trips With Equal Average Trip Lengths

Trips of < 500 miles	
Percent Improvement in Door-to-Door Time	33.9%
Percent of Total Intercity Travel Time	48.3%
Total Impact	16.4%
Trips of 500 – 999 miles	
Percent Improvement in Door-to-Door Time	55.2%
Percent of Total Intercity Travel Time	14.0%
Total Impact	7.7%
Trips of ≥ 1,000 miles	
Percent Improvement in Door-to-Door Time	72.5%
Percent of Total Intercity Travel Time	13.9%
Total Impact	10.1%
Total All Distances	34.2%